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Pesticide Fact Sheet Number 34.1: Phorate

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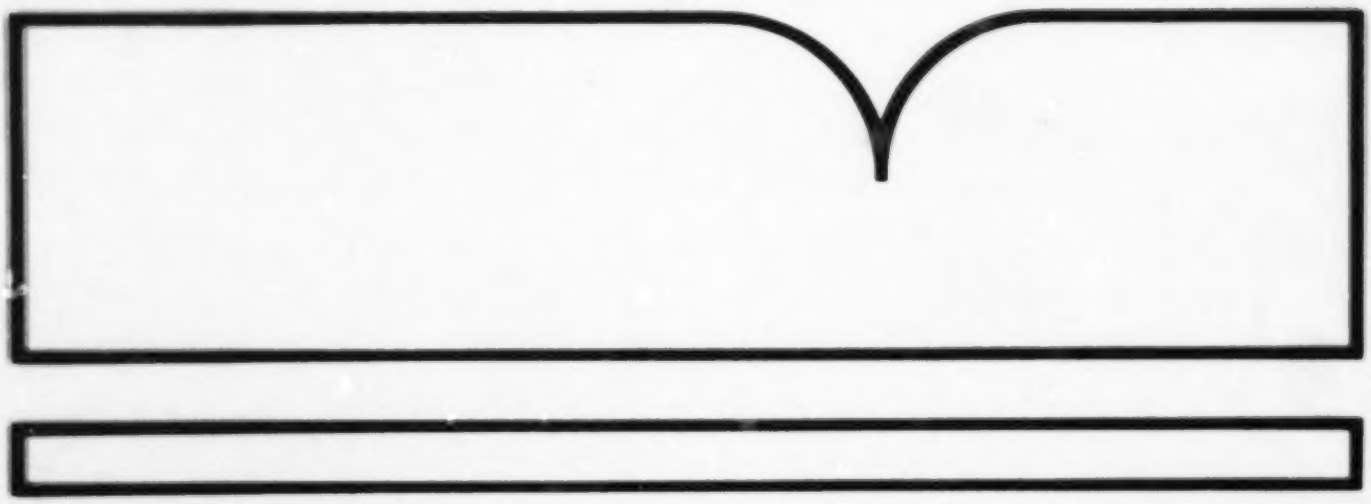

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16. Abstract (Limit: 200 words)

This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

17. Document Analysis a. Descriptors

Pesticides, regulations, Chemical Information Fact Sheet, Use Patterns, Science Findings

b. Identifiers/Open-Ended Terms

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EPA

Pesticide Fact Sheet

Name of Chemical: PHORATE
Reason for Issuance: COMPLIANCE DATE RESTRICTED USE
Date Issued: FEB. 1, 1985
Fact Sheet Number: 34.1

1. Description of chemical

Generic name: 0,0-diethyl S-[(ethylthio)methyl]phosphorodithioate
Common name: Phorate
Trade name: Thimet, Rampart
EPA Shaughnessy Code: 057201
Chemical Abstracts Service (CAS) Number: 298-02-2
Year of Initial Registration: 1959
Pesticide Type: Insecticide-nematicide
Chemical Family: Organophosphate
U.S. and foreign producers: American Cyanamid Co. (U.S.)

2. Use patterns and formulations

Application Sites: Non-domestic terrestrial and aquatic food/feed crops; and greenhouse commercial nursery stock (both outdoor and greenhouse).
Type of Formulations: Granular, emulsifiable concentrate
Application Rates (lbs. active ingredient): Ornamentals - 8-20 lbs./A (10% granular product); Agricultural food/feed crops - 1-3 lbs./A (10-20% granular product) except sugarcane which is 4 lbs./A and potato which is 3.6 lbs./A. The emulsifiable concentrates are applied at 1 lb./A (6 lb/gal. emulsifiable concentrate) for Bermudagrass; and at 2-2.18 lb./150 lb. seed (8-8.7 lb./gal. emulsifiable concentrate) for treatment of cottonseed.

3. Science findings

Summary science statement:

Phorate has a very high acute toxicity to humans, fish and wildlife. Pertinent data are lacking, however, and the Agency cannot conduct a full risk assessment until the data required in this Standard are submitted and evaluated.

Certain oxidation products of phorate are more toxic than phorate itself. The oxidation products were previously toxicologically discounted in the establishment of the tolerances for phorate.

The Agency does not, however, have the data needed to determine the level at which the identified metabolites are present in the residues occurring in or on the raw agricultural commodities resulting from the

current registered uses of phorate. Also, the metabolism of phorate in animals is not adequately understood. Adequate metabolism studies utilizing ruminants are needed to determine the distribution and characterization of residues in tissues and milk. In addition, the toxicological studies needed to establish the acceptable daily intake levels of the identified metabolites are also lacking. Depending on results of the residue studies required to be submitted under the Standard, the dietary risk may be greater than it earlier appeared to be, although it may also be the same as before.

Chemical Characteristics:

Physical State: Liquid
Color: Clear
Odor: Skunk-like
Boiling Point: 118-120°C at 0.8 mm Hg
Melting Point: N/A
Flammability: 160°C (tagliabue open cup)
Solubility in Water: 50 ppm
There are no unusual handling characteristics.

Toxicology Characteristics:

- Acute Oral rat LD_{50}; 3.7 mg/kg (male); and 1.4 mg/kg (female); Toxicity Category I.
- Acute Dermal rat LD_{50}; 9.3 mg/kg (male); and 3.9 mg/kg (female); Toxicity Category I.
- Acute Inhalation rat LC_{50}; 60 mg/m^3 (male); and 11 mg/m^3 (female); Toxicity Category I.

- The major routes of exposure in order of toxicological significance: inhalation, dermal.

- Chronic toxicology results: Adequate studies include subchronic feeding in the rat, oncogenicity studies in the rat and the mouse, three generation reproduction, and teratology study in the rat. The available mutagenic studies include tests in vitro microbial and mammalian cells, and in vivo dominant lethal. No adverse effects were found in any of these studies.

Physiological and Biochemical Behavioral Characteristics:

Foliar absorption: N/A
Translocation: Available metabolism studies indicate that phorate and its soil metabolites are absorbed from the soil by plant roots and translocated to above-ground portion of the plant.
Mechanism of pesticidal action: As as organophosphate, phorate exerts its toxic action by inhibiting certain important enzymes of the nervous system, cholinesterase (ChE).

Metabolism and persistence in plants and animals: The metabolism in plants is adequately understood. Phorate is metabolized in plants by rapid oxidation to the sulfoxide (some oxidation to the O-analog may also occur), followed more slowly by oxidation to the sulfone and/or the O-analog sulfoxide; phorate sulfone and phorate O-analog sulfoxide are then further oxidized to the O-analog sulfone. Available studies indicate that hydrolysis of the oxidized metabolites eventually occurs to yield non-toxic water-soluble products. A field study of corn treated at 1 lb. a.i./A with 10% granular formulation indicate that phorate residues were nondetectable (<0.002 ppm) after 14 days while residues of the sulfoxide and sulfone persisted to 28 days. After 83 days, there were no detectable residues occuring in the kernels, cobs or husks.

The metabolism of phorate in animals is not presently understood due to lack of sufficient data.

Environmental Characteristics:

Phorate has some potential to leach through soil and contaminate ground water, particularly where soils are sandy and aquifers are shallow. Simulation of the leaching potential of phorate using the Pesticide Root Zone Model (a computer model which predicts movement through the root zone and the unsaturated soil zone based on chemical and soil properties) predicts some mobility in sandy soils but none in loam soils under typical phorate use conditions. Because of lack of sufficient data regarding the environmental behavior of phorate, the Agency is unable to completely evaluate the leaching potential. Additional studies are being requested on an accelerated basis; these studies include hydrolysis, metabolism, and mobility studies and, in particular, a field dissipation study which is to be carried out in a potato-growing area of Long Island, New York.

Ecological Characteristics:

- Avian Oral LD_{50} = 0.62 mg/kg (mallard) and 7.12 mg/kg (pheasant).
- Avian Dietary LC_{50} = 24 to 77 ppm (upland gamebirds) and 712 ppm (waterfowl).
- Fish LC_{50} = 6 to 13 ppb (coldwater fish) and 2 to 280 ppb (warmwater fish).
- Aquatic Invertebrate LC_{50} = 4 ppb.

Based on these studies, phorate is very highly toxic to avian species, freshwater fish and aquatic invertebrates. Regarding endangered species, there is a potential risk to the Aleutian Canada goose, Attwater's greater prairie chicken and the Kern primrose sphinx moth.

Tolerance Assessments:

Refer to attached table for the list of current tolerances established for phorate. Available data are not sufficient to conduct a tolerance assessment.

4. Summary of Regulatory Position and Rationale

Use classification: All emulsifiable concentrate (EC) phorate formulations containing 65% and greater and all granular formulations of phorate for use on rice have been previously classified restricted use pesticides pursuant to 40 CFR 162.31. All granular formulations containing 5% phorate and greater have been classified as restricted use pesticides under this Registration Standard. In addition, all granular formulations containing less than 5% phorate are considered restricted use pesticides pending receipt and evaluation of data required to be submitted under this Standard. All products subject to the restricted use requirement which are released for shipment after September 1, 1985 must be labeled for restricted use. All products subject to the restricted use requirement which are in channels of trade after September 1, 1986 must be labeled for restricted use.

Though there are no EC formulations containing less than 65% phorate currently registered, such formulations would be considered restricted use pesticides.

Use, formulation or geographical restrictions: Products containing phorate are not to be used or stored in or around the home. Geographical restrictions of varying degrees currently exist on some or all of the uses on Bermuda grass, corn, lettuce, rice, sorghum, sugarcane, tomato, wheat, and lilies. End-use products may be granular or liquid formulations.

Unique warning statements required on labels: Phorate manufacturing-use products (MP) require the use of protective clothing and respirator. End-use products require the restricted use statement and use of protective clothing. The phorate products for greenhouse use require the use of a respirator. A restriction against reentering treated fields before 24 hours after application is also required.

No new uses or tolerances for phorate will be considered until the human and environmental concerns raised in this Document are satisfactorily resolved.

5. Summary of Major Data Gaps

Toxicology: Acute delayed neurotoxicity; 6-month feeding studies (on the identified oxidation metabolites); chronic feeding study (non-rodent); a teratology study in a second species (other than the rat)*; mutagenicity studies and product integrity studies and a general metabolism study.

* A rabbit teratology study has recently been submitted and is currently under review by the Agency.

Environmental Safety: Avian reproduction; fish life cycle (freshwater); full field studies including population monitoring (avian, mammalian and aquatic species); and secondary poisoning studies for one mammal and one avian species.

Environmental Fate: Hydrolysis; photodegradation (water, soil, air); metabolism (aerobic soil and aquatic, anaerobic soil or aquatic); leaching; volatility; dissipation; accumulation (rotational crop, irrigated crop, fish; and aquatic organisms); and re-entry studies (dermal and inhalation exposure; and soil and foliar dissipation).

Residue Chemistry: Plant metabolism (the quantification of the oxidation products of phorate contained in the residue in or on raw agricultural commodities, including meat, milk, poultry and eggs, for which tolerances have been established as a result of the maximum registered use of phorate); livestock metabolism; and additional residue data (for each established tolerance except Bermudagrass and milk).

All data are to be submitted by July, 1987.

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